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ABSTRACT

Two aptitude treatment interaction questions were investigated: (1) relationship between prior learning and instructional method, and (2) interaction between anxiety and the opportunity to rewind instructional tapes. Students from five educational psychology classes (112 undergraduate) were shown video modules under either of two conditions: (1) individually, with the option of rewinding the module as desired, and (2) in groups, without a rewind option. Before beginning the first module, the Test Anxiety Scale and Worry-Emotionality Scale were administered, followed by a pretest dealing with material to be covered by the modules then administered. The Worry-Emotionality Scale was later readministered, and a posttest was given. Data was analyzed by multiple regression analyses. As predicted, students low in prior achievement learned significantly more in the individual condition than in groups, and high anxiety students achieved more with the option to rewind than without. The results provide support for the formulation that prior learning is an important construct for aptitude-treatment interaction research and educational practice; also supported is the hypothesis that being able to review instructional content is beneficial to high anxiety students. (Author/GK)

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Abstract

Prior Achievement, Anxiety, and Instructional Method

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This study investigated two aptitude-treatment interaction questions: 1) the relationship between prior learning and instructional method, and 2) the interaction between anxiety and the opportunity to rewind instructional tapes. One hundred and twelve undergraduates were shown video modules under either of two conditions: 1) individually, with the option of rewinding the module as desired, and 2) in groups, without a rewind option. As predicted, students low in prior achievement learned significantly more in the individual condition than in groups, and high anxiety students achieved more with the option to rewind than without it.

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Prior Achievement, Anxiety, and Instructional Method[1]

Date Submitted: May 5, 1980

Running Head: Achievement, Anxiety, and Instructional Method

Recently much research has appeared which deals with the interaction between learner aptitudes and instructional treatments. Reviews of this research (Cronbach and Snow, 1977; Snow, 1976, 1977, Tobias, 1976, Note 1) reveal a need for further theoretically based investigation leading to replicated aptitude treatment interactions (ATI's) to serve as guides for further research and practice. The present study is concerned with one aspect of that research: the interaction of achievement and instructional method with prior achievement and anxiety.

[1]This paper will be presented at the annual convention at the American Psychological Associations, Montreal, September 1980.

Prior Achievement and Instructional Method

Tobias (1973, 1976) suggested that prior achievement is a variable which interacts meaningfully with instructional method, advancing the hypothesis (Tobias, 1976) that the level of prior achievement was inversely related to the amount of instructional support a student needs to accomplish instructional objectives. Those low in prior experience with a particular content would thus be most facilitated by being provided with a variety of learning aids which provide additional instructional support. Conversely, students higher in prior achievement may profit little from additional instructional support. In this study, it was expected that high instructional support (in the form of having the ability to rewind a video tape) would result in better performance for those with limited prior experience compared to similar students who were not able to rewind the tape.

Reviews of research pertinent to the hypothesized inverse relationship between prior achievement and instructional support (Tobias, 1976, Note 1) have generally reported results in accord with expectations. The types of instructional support previously investigated included such variables as constructed responding with feedback compared to reading an instructional program with all response blanks filled in (Tobias and Ingber, 1976), comparing achievement on a logically organized program to that obtained from a program with frame sequence assigned by a table of random numbers (Dyer and Kulhany, 1974; Tobias, 1973) and comparisons of mastery based instructional strategies to conventional college lectures (Pascarella, 1978, Ott, 1976). It has been noted (Tobias, 1976, Note 1) that research using other forms of instructional support and a wide range of subject matter would be useful in order to

demonstrate the generality of the achievement treatment formulation.

The present study extended prior research in two ways: 1) By utilizing a form of instructional support not previously investigated (pairing a group which could rewind a video tape whenever it was considered necessary to a group without this option), and 2) By using media (video tapes) and subject matter (modules dealing with individualized instruction) not previously utilized in research on this hypothesis.

Group Versus Individual Pacing

The literature most pertinent to the independent variable manipulated in this study (being able to rewind the video tape) deals with the effects of group versus individual pacing. Most recent research on pacing has been conducted in a context of PSI (Personalized Systems of Instruction) or, more generally, behavioral instructions.

Robin (1976) stated that most studies on the effectiveness of behavioral instruction (which allows the learner to pace himself) found self pacing more effective than traditional group methods of instruction. Morris, Surber, and Bijou (1978), however, felt that recent research indicates that self-pacing in studies of PSI may have been confounded with other factors such as withdrawal rates and procrastination. The failure of many students to pace themselves effectively through a PSI course has been cited as the primary reason for higher withdrawal rate in courses. In order to improve pacing and reduce student withdrawal from courses; instructor rather than student pacing has been used in several PSI courses. However, there has been very little experimental research comparing the relative effectiveness of the two.

Reiser and Sullivan (1977) found no significant differences between different pacing groups in achievement, however the number of students who withdrew from courses was significantly higher in a self-paced group than in an instructor-paced group. Morris, Surber and Bijou (1978) found that instructor and self-paced groups scored similarly on pre, post and retention tests. No differences, however were found in either withdrawal rates or the number of units completed.

Alderman (Note 2), using pretest scores in Math and English CAI courses, found that students weak in entrance ability failed to satisfy course requirements, while those high in prior familiarity completed the course and did well on pretests. Alderman also found that those with less prior familiarity with the subject matter tended to require greater instructional support, thereby spending more time on task. Mabee, Neimann, and Lipton (1979) found that the different pacing styles did not create differential course achievement, but there was an interaction of pacing with prior achievement. Students who started the course with high prior achievement (as measured by grade point average) performed better under self pacing conditions.

Denton and Seymour (1978) found a significant effect for pacing in which the group given less time achieved more. They also found a significant effect for the interaction between pacing and remediation, in that the remediation strategy which specified in detail how to correct deficiencies was better for less intense pacing, while less specific remediation was better for the time compressed program.

Anxiety and Instructional Method

A large number of studies investigaged the interaction between anxiety and instructional method (Cronbach and Snow, 1977; Tobias, 1977a). Despite this intense activity, there were few replicated interactions in this area,

and few firdings which had any generality across different types of subject matter. Often, interactions found in one study (Peterson, 1977) were reversed in a further study using different subject matter and different samples (Peterson, 1979).

Tobias (1977b, 1979) proposed a research model specifying the point in an instructional sequence where anxiety could be expected to have the most important effect on achievement. Since anxiety is an affective state, it can impact on achievement only indirectly by affecting the cognitive processes controlling learning. Three major types of effects of anxiety on learning from instruction are specified in the model: a preprocessing effect, an effect during processing while the instructional input is represented internally and being organized and stored, and an effect after processing when previously stored material is being retrived. Preprocessing effect refers to that point when nominal instructional input is not effective due to the interference of anxiety. Presumably, the attention of learners high in anxiety is more likely to be directed from the task at hand to a variety of self concerns as specified by Sarason (1972), and by Wine (1971). Kreitzberg and Tobias (Note 4) found that one mechanism accounting for this form of interference may be that extraneous thoughts of high anxiety individuals interfere with the rehersal of instructional input in short term memory.

Preprocessing interference is assumed to be especially debilitating to learning since its effect is predicted to be cumulative. That is, instructional input that has not effectively registered internally imposes a greater burden on figuring out that proportion of input missed during the succeeding processing stage, and a greater burden in retrieving only

partially learned materials from long term memory. The model suggests that any form of review permitting learners to reinspect instructional input they might have missed initially will be selectively beneficial to high anxiety learners, compared to their lower anxiety counterparts. In this study it was, therefore, hypothesized that the ability to rewind a video tape lesson should improve the learning of students high in anxiety to a greater extent than those lower in anxiety.

Method

The students of two classes were assigned to view four modules dealing with individualized instruction on individually controlled video recorders, with instructions to rewind the tape whenever they felt they needed to. Three other classes viewed the same modules in group form without any rewind provision. At the end of the fourth module a summative posttest covering the modules was administered.

Procedures

The four video modules took approximately 30 to 45 minutes each. The modules dealt with the following: 1) An introduction to individualized instruction, 2) Programmed instruction, 3) An introduction to computers in education, and 4) Computer assisted and computer managed instruction.

Students with the opportunity to rewind viewed each module on a monitor connected to an individually controlled video recorder. The equipment was placed in adjoining carrels and earphones were supplied to students. Individual appointments for viewing each of the four modules were made any time at students' convenience during a three week time span. At the completion of the fourth module, a summative posttest dealing with the content of all four modules was administered.

Classes viewing the modules without opportunity for rewinding watched the video tapes in group form. Two large screen TV monitors were placed in corners of the classroom so that everyone had an opportunity to see the screens. Two modules were shown during a two hour class period, and the second two in the succeeding two hour period.

In both the individual and group administrations there was sufficient illumination for students to take notes if they chose to. In addition, all students received specific objectives dealing with each of the modules, and were supplied with a worksheet on which questions pertaining to the module were asked.

Prior to the beginning of the first module, the Test Anxiety Scale (Sarason, 1958) and the Worry-Emotionality Scale (Liebert and Morris, 1967) were administered. For the Worry-Emotionality Scale students were asked to respond in terms of how they felt at the moment. A pretest dealing with material to be covered by the modules was then administered. The Worry-Emotionality Scale was readministered after the completion of the fourth module, with instructions to respond in terms of how students felt as they anticipated taking the posttest. The summative posttest, which covered essentially the same subject matter as the pretest but contained different questions, was than given. The alpha-reliability of the pretest was .69 and that of the posttest was .96. There were no significant differences in pretest scores among the groups.

Subjects

Instructors in five educational psychology classes participating in this experiment obtained student consent for participation. Complete data

were available for a total of 112 students from the five educational psychology classes. Since some students elected not to record their names on the answer sheets, grade point average and entry data were unavailable. In general, classes were composed of about 75% females and 25% males. There were 62 subjects in the group treatment, and 50 in the individual treatment.

Results and Discussion

The data were analyzed by multiple regression analyses. The results are shown in Table 1.

Insert Table 1 here

Summative test scores were used as the dependent variable. The independent variables were treatment (group/independent), TAS, and pretest scores.

Significant main effects were found for both treatment and pretest, indicating that those who viewed the modules independently performed significantly better than those who saw them in groups (the posttest mean for independents was 31.9, with a standard deviation of 7.1; the posttest mean for groups was 21.3, with a standard deviation of 10.3). Pretest scores were positively related to scores on the summative test ($r = .49$).

As predicted, significant interactions were found between treatment and TAS (see Figure 1) and between treatment and pretest scores (see Figure 2). A significant interaction was also found among treatment, pretest, and anxiety.

Insert Figure 1 here

Figure 1 showes the interaction between treatment and prescore. The greatest difference between the two groups, as predicted, was found at lower levels of pretest score. As prescore level went up, the difference between the two treatments decreased, providing support for the hypothesis

that those at low levels of prior achievement will achieve more when given instructional support, while at higher levels of prior achievement less instructional support is necessary.

Insert Figure 2 here

Figure 2 shows the interaction of anxiety and treatment. This interaction indicated that, as expected, anxiety was especially debilitating when students viewed the tape in group form without the ability to rewind the tape. For those viewing independently, there was little difference between the performance of low and high anxiety students. As predicted, at lower TAS score levels there was less difference between the two methods.

The results strongly support both hypotheses dealing with the interaction between anxiety and instructional method and between prior achievement and method. There are, of course, several limitations to the generality of these results. Principally, the instructional support of being able to rewind the video tape was contaminated with assignment to viewing the tape individually or as part of a group. While it is unclear what variables, other than the ability to rewind, might be operative in the individual and group situation which could have accounted for these results, it is nevertheless desirable to extend the present work by separating the effects of having the opportunity to rewind and individual or group assignment. Research in which all students were assigned to an individual mode and some denied the opportunity to rewind a tape would clarify this problem.

A second potential limitation to the generality of this experiment was that it was impossible to assign students randomly to treatments. The pretest mean for the independents (8.2, standard deviation = 4.0) was slightly higher than the pretest mean for groups (7.0, Sd = 3.11).

The results dealing with prior achievement provide continuing support for the formulation that prior learning is an important construct for both ATI research and educational practice. Further research relating a variety of instructional methods differing in the type and amount of instructional support provided to prior achievement would appear to be a promising way to enlarge our understanding of the relationship between instructional method and student individual differences in prior achievement. If the general hypothesis of an inverse relationship between prior achievement and instructional support continues to receive experimental verification, it could be an important guide to improved educational practice. That is, in general, students with high relevant prior experience could be assigned to instructional methods providing little instructional support. Typically, such methods are economical both with respect to financial cost and time. Conversely, students of low prior achievement can be expected to perform optimally with methods providing high instructional support. In this study, the implication is that students with low prior achievement who have an opportunity to review instructional content which they are working on individually can be expected to perform at a higher level than those denied that opportunity.

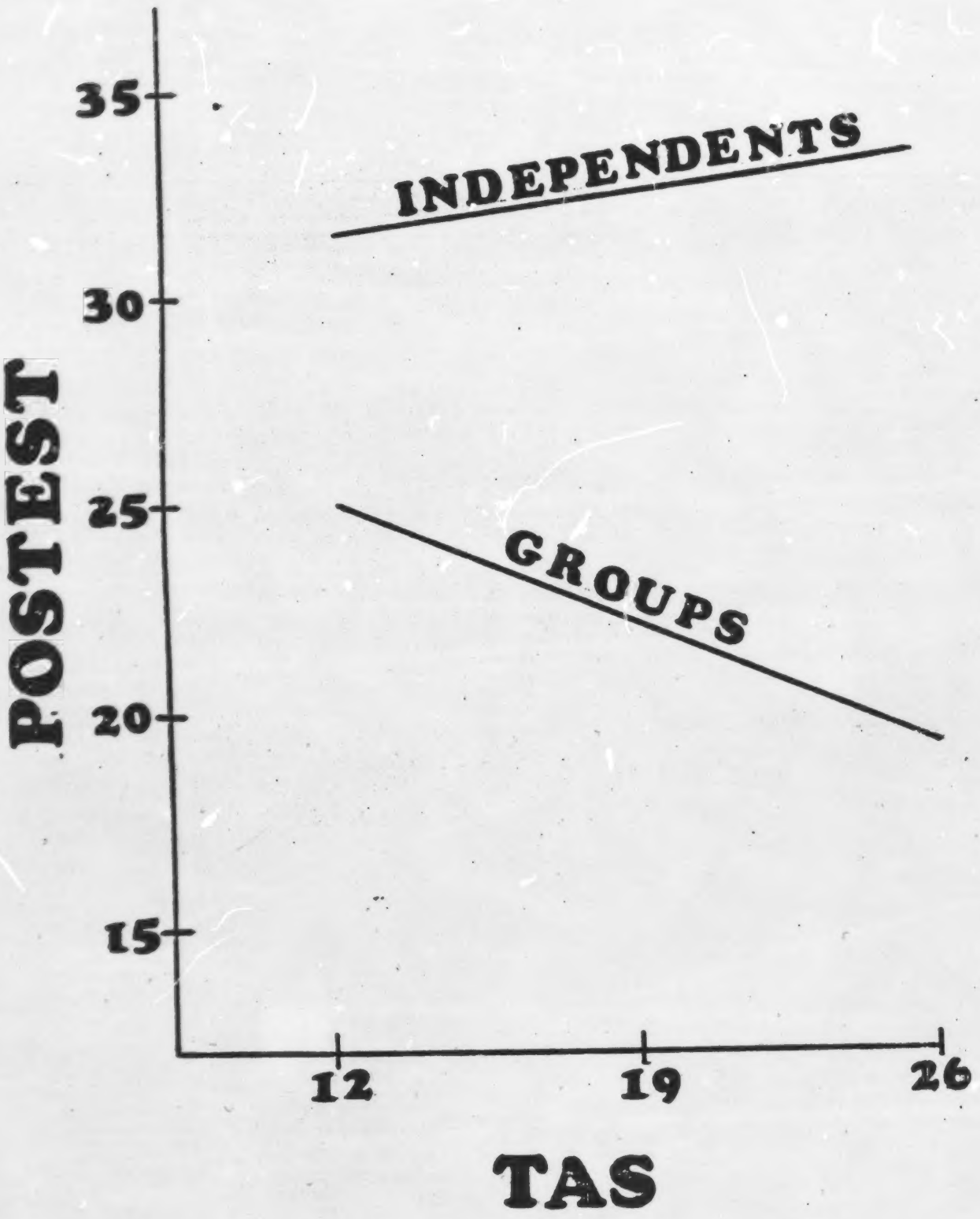
The anxiety results support the hypothesis that being able to review instructional content is especially beneficial to students high in anxiety. These findings confirm a part of Tobias' (1977b, 1979) model which suggests that being able to reinstitute instructional input is differentially

beneficial to high anxiety students. The educational implications of these findings are that high anxiety students should be instructed with methods which place little reliance on the students' intermediate term memory.

Captions

Fig. 1. The Interaction of Pretest with Treatment, with TAS held constant.

Fig. 2. The Interaction of TAS with Treatment, with Pretest scores held constant.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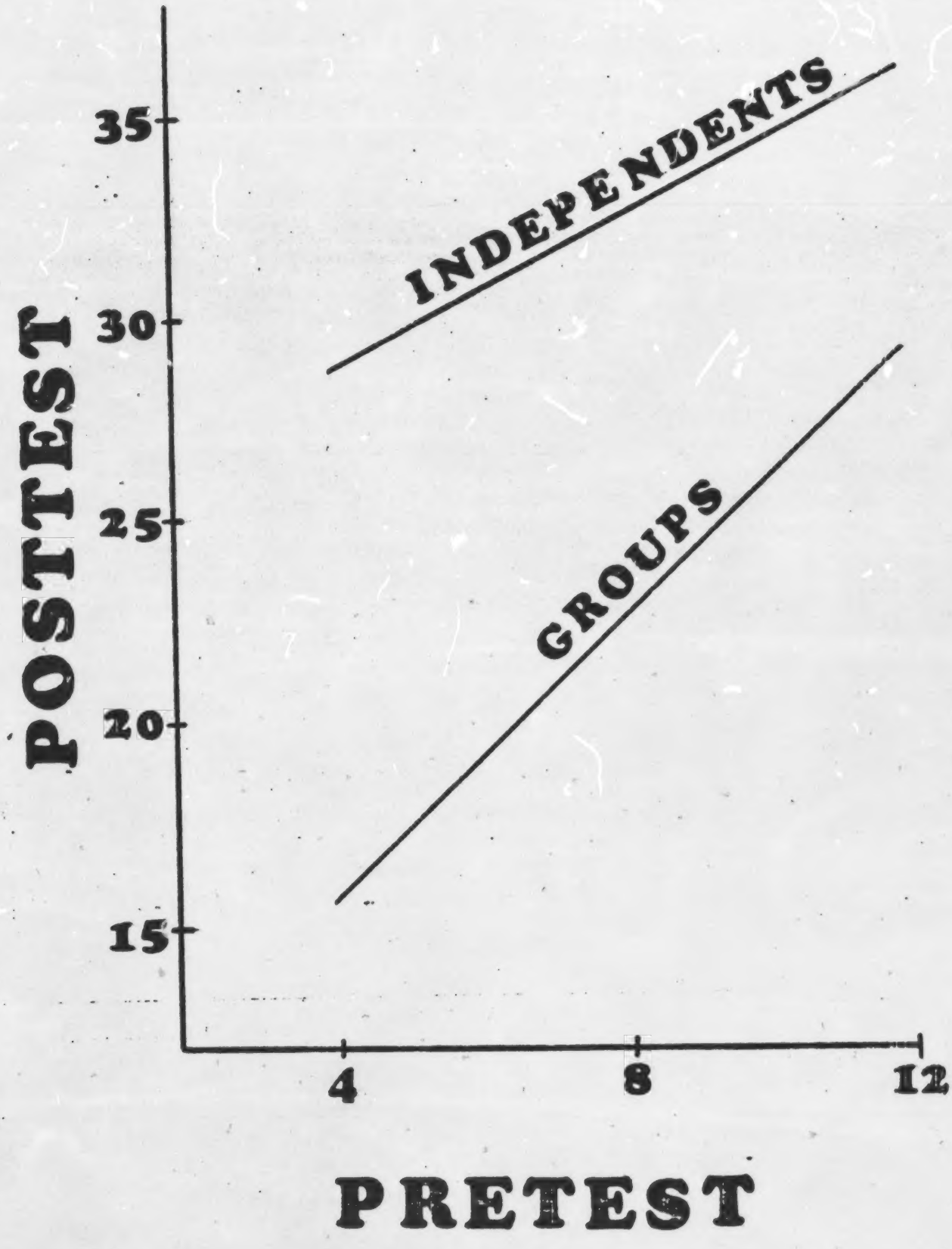
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Table 1

RESULTS OF REGRESSION ANALYSIS

Variable	Regression Wts. [a]	r[b]	% Variance	F
Treatment	26.55	0.51	0.19	39.28***
Pretest	2.89	0.49	0.15	30.77***
TAS	0.11	-0.10	0.001	0.20
Treatment*TAS	-0.53	—	0.02	4.25*
Treatment*Pre	-3.29	—	0.02	4.65*
TAS*Pretest	-0.06	—	0.00	0.59
Tr*TAS*Pre	0.13	—	0.02	3.83

a. Regression Constant = 6.40

b. Correlation with Summative Test

***=p.001
**=p.01
*=p.05

Footnotes

1. This paper was presented at the annual convention of the American Psychological Association, Montreal, September 1980.

2. Preparation of this paper was partially supported by the Institute for Research and Development in Occupational Education, Center for Advanced Study of Education, City University of New York.